



SCHOOL OF COMPUTING AND ENGINEERING SCIENCES
BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONICS
ENGINEERING
BEE 3204: DATA COMMUNICATION AND NETWORKING
SPECIAL EXAM

Date: 26th May, 2026

Time: 2 Hours

Instructions:

1. This Examination consists of **FIVE** questions
 2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.
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Question One [30 Marks]

- a) Draw the OSI model and state the role of each of the layers.
(5 marks)
- b) Explain how address resolution protocol happens. Use a diagram for illustration.
(3 marks)
- c) Explain two types of multiplexing.
(4 marks)
- d) Explain the operation of Network Address Translation (NAT) with the aid of a diagram.
(3 marks)
- e) Consider the following IP address: 10.0.0.0/13. Compute the following:
 - i. Number of subnets
 - ii. Number of hosts per subnet
 - iii. Subnet mask in decimal notation.
 - iv. Broadcast IP address of the last subnet
(4 marks)
- f) Explain two WAN protocols that Kenya Power can use to transfer data across its branches.
(4 marks)
- g) Explain four network security objectives.

(4 marks)

h) State three differences between a router and a switch.

(3 marks)

Question Two [15 Marks]

a) Two Safaricom base stations need a transmission medium to interlink them when routing traffic. The link carries aggregated traffic from many customers and the distance between the base stations usually range from hundreds of meters to tens of kilometers. State practical two options and one advantage and one disadvantage of each.

(6 marks)

b) With respect to the Strathmore University network, answer the following questions.

i. Explain why a link state routing protocol such as OSPF would be preferred over distance vector routing protocol

(2 marks)

ii. Explain why dynamic routing would be preferred over static routing

(2 marks)

c) Explain which protocol between TCP and UDP is suitable for browsing the web.

(2 marks)

d) Briefly explain the operation of MPLS and why it is preferred over IP routing in wide area networks.

(3 marks)

Question Three [15 Marks]

a) Examine Figure Q3(a). Use it to answer the questions below.

i. Write down the sequence of commands that you could use to enable RIP on R2 and advertise all the relevant routes. (2 marks)

ii. Assuming Cisco routers, write down the commands to check the following in router R2:

- Routing table (1 mark)
- The entire configurations of R3 (1 mark)
- The routes the packets will follow all the way to PC1. (1 mark)

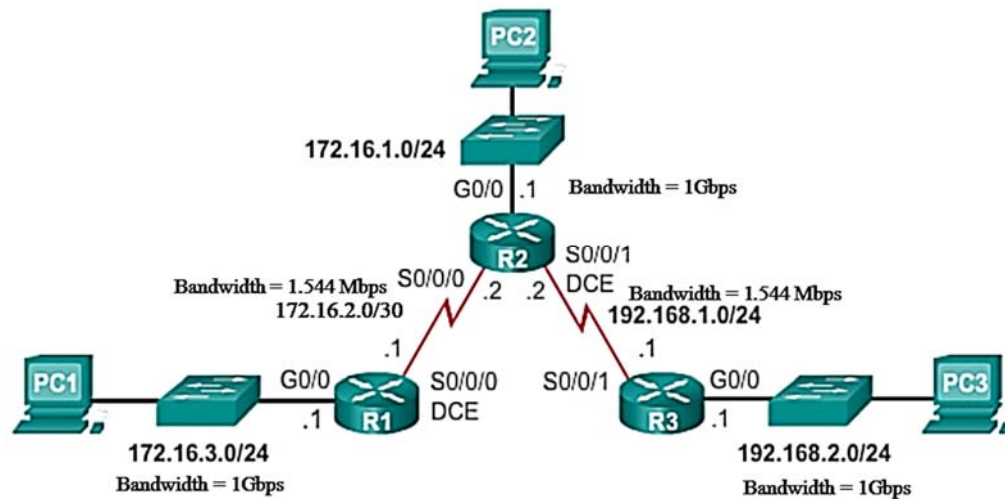


Figure 3 (a)

- b) Ofgen Corporation is a mid-sized company with three departments: HR, Sales, and IT. Each department occupies a separate floor in the same building: HR is on Floor 1, Sales is on Floor 2, IT is on Floor 3.
- Explain two reasons why VLANs would be useful to the company (4 marks)
 - Write the necessary commands to create the VLANs in one of the switches. Assume Cisco switches. (3 marks)
- c) Explain whether a WhatsApp call is packet switched or circuit switched.

(3 marks)

Question Four [15 Marks]

- a) Explain two network security techniques that Strathmore University can use to protect its network.
- b) Distinguish between software defined networking and the traditional networking.
- c) Distinguish between public and private IP addresses.
- d) Use the Shannon channel capacity to explain the following:
- Data rates go down when there are multiple Wi-Fi networks in one area.
 - 3G has higher data rates compared to 2G.

(6 marks)

(3 marks)

(2 marks)

(2 marks)

(2 marks)

Question Five [15 Marks]

- a) With the aid of a diagram, explain the operation of the Internet in terms of moving traffic from a Strathmore University server to a server in Europe. The explanation and diagram should cover how traffic moves and the key elements.

(5 marks)

- b) Explain the role of ports in networking and state two common protocols and their associated port numbers.

(5 marks)

- c) State three benefits of the switch from analogue TV to digital TV.

(3 marks)

- d) State two applications of the following:

- i. Synchronous transmission
- ii. Asynchronous transmission

(2 marks)